Indiana Department of Education
Academic Standards Content Framework

# ADVANCED LIFE SCIENCE: FOODS

*Advanced Life Science: Foods* is a two semester course that provides students with opportunities to participate in a variety of activities including laboratory work. This is a standards-based, interdisciplinary science course that integrates biology, chemistry, and microbiology in the context of foods and the global food industry. Students enrolled in this course formulate, design, and carry out food-base laboratory and field investigations as an essential course component. Students understand how biology, chemistry, and physics principles apply to the composition of foods, the nutrition of foods, food and food product development, food processing, food safety and sanitation, food packaging, and food storage. Students completing this course will be able to apply the principles of scientific inquiry to solve problems related to biology, physics, and chemistry in the context of highly advanced industry applications of foods.

- DOE Code: 5072
- Recommended Grade Level: Grade 11-12
- Recommended Prerequisites: Chemistry, Biology, Introduction to Agriculture, Food and Natural Resources, Food Science, Nutrition and Wellness, Advanced Nutrition and Wellness,
- Credits: 1 credit per semester, maximum of 2 semesters, maximum of 2 credits
- Fulfills a Core 40 Science requirement for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas or counts as an Elective or Directed Elective for any diploma
- This course is aligned with postsecondary courses for Dual Credit
    - Purdue University
        - FS 16100 – The Science of Food

**Dual Credit**
This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

**Application of Content**
Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences

**Career and Technical Student Organizations (CTSOs)**
Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in FCCLA and/or FFA, the CTSOs tor the most closely related subject matter areas.

## Content Standards

**Domain - Chemistry of Food**
**Core Standard 1** Students apply and adapt chemical background information that relates directly to various foods and their preparation to understand chemical structure, composition, and reactions in the

chemistry of food.

**Standards**

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| ALSF-1.1 | Discuss how research and industry developments lead to improvements in the food products and processing industry |
| ALSF-1.2 | Conduct research in food science and interpret results to improve food products |
| ALSF-1.3 | Explain the application of chemistry and physics to food science |
| ALSF-1.4 | Explain how the chemical and physical properties of foods influence nutritional value and eating quality |
| ALSF-1.5 | Determine the chemical and physical properties of food products |
| ALSF-1.6 | Compare and contrast the nutritive value of food and food groups |
| ALSF-1.7 | Discuss common food constituents (e.g., proteins, carbohydrates, fats, vitamins, minerals) |
| ALSF-1.8 | Analyze food products to identify food constituents |
| ALSF-1.9 | Identify common food additives (e.g., preservatives, antioxidants, buffers, stabilizers, colors, flavors) |
| ALSF-1.10 | Formulate and explain incorporation of additives into food products |
| ALSF-1.11 | Describe factors in planning and developing a new food product (e.g., regulation, creativity, and economics) |
| ALSF-1.12 | Perform sensory-testing and marketing functions to characterize and determine consumer preference and market potential |
| ALSF-1.13 | Describe enzymes, the changes they cause in foods and the physical and chemical parameters that affect enzymatic reactions |
| ALSF-1.14 | Describe major chemical and physical properties of food systems that are important to food quality and sensory perception (PU – FS 16100) |

**Core Standard 2** Students connect applied and practical chemistry concepts to the preparation, preservation, and digestion of foods to understand their biological makeup.

**Standards**

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| ALSF-2.1 | Identify quality and yield grades of food products |
| ALSF-2.2 | Discuss factors that affect quality and yield grades of food products |
| ALSF-2.3 | Use weights and measures to formulate and package food products |
| ALSF-2.4 | Identify methods of food preservation and give examples of foods preserved by each method |
| ALSF-2.5 | Preserve foods using various methods and techniques |
| ALSF-2.6 | Identify foods produced through fermentation |
| ALSF-2.7 | Compare and contrast bioengineering and conventional pathways used in food processing |
| ALSF-2.8 | Process food using biotechnology |
| ALSF-2.9 | Describe the process used in producing alcohol from biomass |
| ALSF-2.10 | Describe factors in planning and developing a new food product |
| ALSF-2.11 | Explain the importance of oxidation and reduction in food science |
| ALSF-2.12 | Relate the chemical and physical properties of fats and oils to their chemical |

structures

ALSF-2.13 Describe the hydrogenation process

ALSF-2.14 Compare and contrast the chemical structures of natural sugars

ALSF-2.15 Demonstrate an understanding of the components of dietary fiber

ALSF-2.16 Describe the chemical structures of organic acids

ALSF-2.17 Define and give examples of natural toxicants

ALSF-2.18 Compare and contrast various browning reactions

ALSF-2.19 Describe food processing/preservation methods and packaging systems, including their application in the conversion of raw materials into food products (PU – FS 16100)

**Core Standard 3** Students analyze processing additives used on and in foods to determine their overall effects of the additives on the final food product for human consumption.

**Standards**

ALSF-3.1 Discuss the processing additives and final product additives including their chemical, physical, microbial effects on food components

ALSF-3.2 Describe the chemical similarities and differences between sugars and artificial sweeteners in foods and food processing

ALSF-3.3 Demonstrate knowledge of how food additives are regulated compared to dietary supplements

**Core Standard 4** Students determine the effects of current governmental regulations on the food, ingredients, and additives that can be used within food preparations and ultimately for human nutrition

**Standards**

ALSF-4.1 Predict trends and implications in the food products and processing industry

ALSF-4.2 Select current government regulations to review

ALSF-4.3 Evaluate the changes in the food products and processing industry brought about by industry organizations or regulatory agencies

ALSF-4.4 Analyze the effectiveness of a food product and processing company's Critical Control Point (CCP) procedures

ALSF-4.5 Interpret quality assurance test results and apply corrective procedures

ALSF-4.6 Describe the role of food laws, regulations and regulatory agencies (PU – FS 16100)

**Domain - Health, Safety, and Microbiology of Food**

**Core Standard 5** Students conduct safe food handling, hygiene, spoilage, and quality control to understand temperature controls, species and structure of microbes, shelf-life, food-poisoning, and the socio-economic impact of the food quality.

**Standards**

ALSF-5.1 Discuss the issues of safety and environmental concerns about foods and food processing

ALSF-5.2 Explain techniques and procedures for the safe handling of food products

ALSF-5.3 Evaluate food product handling procedures

ALSF-5.4 Describe the importance of performing quality-assurance tests on food products

ALSF-5.5 Interpret quality-assurance test results and apply corrective procedures

ALSF-5.6 Describe the effects food-borne pathogens have on food products and humans

ALSF-5.7 Explain the importance of microbiological tests in food product preparation

ALSF-5.8 Characterize the physical, chemical and biological properties of microbes

ALSF-5.9 Explain reasons for detecting microbes and identify sources of microbes

ALSF-5.10 Research and describe the use of biotechnology to detect microbes

ALSF-5.11 Design and perform an assay to detect a target microorganism in food, water or the environment

ALSF-5.12 Explain the role of chemical reactions, enzymes and microorganisms in food spoilage, food preservation and food-borne disease (PU – FS 16100)

ALSF-5.13 Develop personal food selection and food handling habits that will minimize risk of contracting food-borne or water-borne disease (PU – FS 16100)

**Core Standard 6** Students draw conclusions about food and food safety.

**Standards**

ALSF-6.1 Study spoilage, microorganisms, and food handling and processing standards

ALSF-6.2 Develop Sanitation Standard Operating Procedures (SSOP) for a food products and processing company

ALSF-6.3 Implement Good Manufacturing Practices (GMP) for a food products and processing company

ALSF-6.4 Articulate a personal set of values related to your decisions pertaining to selection of food products for both your personal and your family's consumption (PU – FS 16100)

ALSF-6.5 Implement a Hazard Analysis and Critical Control Point (HACCP) program for a food products and processing facility

ALSF-6.6 Demonstrate an ability to critically evaluate the validity of information that commonly appears in newspapers, magazines, radio and television (PU – FS 16100)

**Domain - Careers**

**Core Standard 7** Students examine the scope of career opportunities in and the importance of food science to the economy.

**Standards**

ALSF-7.1 Define and explore food science and food business and their role in the economy

ALSF-7.2 Evaluate and explore the food science career opportunities

ALSF-7.3 Identify how key organizational structures and processes affect organizational performance and the quality of products and services

ALSF-7.4 Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society

**Domain - Leadership**

**Core Standard 8** Students validate the necessity of leadership skills development in conjunction with participation in The National FFA Organization (FFA) and/or Family, Career and Community Leaders of America (FCCLA) as a critical component to a well rounded agricultural education.

**Standards**

ALSF-8.1 Acquire and demonstrate communication skills such as writing, public speaking, and listening while refining oral, written, and verbal skills

ALSF-8.2 Recognize and explain the role of the FFA in the development of leadership, education, employability, communications and human relations skills

ALSF-8.3 Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment

ALSF-8.4 Acquire the skills necessary to positively influence others

ALSF-8.5 Develop a skill set to enhance the positive evolution of the whole person

**Domain - Supervised Agriculture Experience/ Cooperative Occupational Family & Consumer Sciences**
**Core Standard 9** Students validate the necessity of a Supervised Agricultural Experience (SAE)/ Cooperative Occupational Family & Consumer Sciences (COFACS) program as a critical component to a well rounded agricultural education.

**Standards**

ALSF-9.1 Explain the nature of and become familiar with those terms related to a SAE and/or COFACS program

ALSF-9.2 Explore the numerous possibilities for an SAE and/or COFACS program which a student might develop

ALSF-9.3 Develop an individual SAE and/or COFACS program and implement record keeping skills